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ABSTRACT

An increasing number of nations connect their schools on the Internet as an acknowledgment to its extreme importance in the education area. This study points to the perils that arise from its use when the users are minors, evaluates the technologies that are currently available to address filtering issues, and outlines a proposed solution for the Greek School Network. The paper suggests that is an unarguable fact that Internet offers a vast mass of information, only some of which is suitable for schools. Every country should establish its own policies to deal with this issue, without raising public concern regarding human rights and individuals' freedoms. This paper groups together potential dangers the Internet can pose and some possible solutions to those dangers. It is suggested that the best solution is the one that combines the right guidance of the students from the educational authority, the informing of parents and the training of educators, together with the technical solution. Discussion includes: techniques and solutions for achieving content filtering; suggested acceptable use policies for the Greek School Network; the Greek School Network's topology; and implementation issues. Includes one figure. (Contains 15 references.) (Author/AEF)

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POLICIES For CONTENT FILTERING In EDUCATIONAL NETWORKS: The CASE Of GREECE

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Abstract: An increasing number of nations connect their schools on the Internet as an acknowledgment to its extreme importance in the education area. Our study specifies the perils that arise from its use when the users are minors and evaluates the technologies that are currently available to address the filtering issues. The thoughts presented in this paper outline our proposed solution for the Greek School Network. By no means the thoughts that are presented here, apply for adults or people who pay to establish access to the Internet.

INTRODUCTION

As the number of computers in schools and the number of children accessing the Internet from the classroom have grown exponentially over the past few years, so too have the challenges facing educators trying to ensure that children have a positive experience when they go online. The educational community cannot ignore the problem, as it will be like it accepts the use of the school network resources for purposes irrelevant to every possible educational goal.

A related debate rages over what percentage of Web sites would truly be considered objectionable. Some advocates argue that sites that would be considered harmful to minors represent only a very small proportion of the Web. What is of greater concern, they say, is that perfectly benign and possibly very useful information could be blocked when software is used to screen inappropriate material. The actual extent to which adult-oriented materials are available on the Internet is irrelevant according to those who support content controls. They believe that any amount of inappropriate content is too much, when children are concerned. Some experts argue that the Web is expanding so fast that it is virtually impossible to track every site that could be

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objectionable. The flip side of that argument is that it is better to minimize access to objectionable content as best we can, even if the occasional site slips through the cracks.

Although pornography on the Internet has captured the greatest attention on the part of policy makers, it is not the only area of potential concern for parents and educators. Many adults are concerned about Web sites that are created by hate groups or devoted to topics such as bomb making and weaponry, gambling or alcohol and smoking. The World Wide Web, however, is not the only source of concern. Children can receive email messages with pornographic file attachments. Of special concern, too, are Internet chat rooms and so-called Instant Messaging, where children can communicate online in real-time with adult strangers who may not have their best interests at heart.

A wealth of information is available on the Internet. White papers [4,5] are opposed to the use of censor ware programs (they call it) in the American libraries and schools, and there are some interesting links that are indicative of the ongoing debate [2,6,9,10].

The Internet truly is like a vast library including millions of readily available and indexed publications, containing content as diverse as human thought. Throughout the past decade, policy makers, industry advocates, parents and teachers have tried to address these concerns especially in the more technologically advanced areas of the earth. This decade may well be the decade of decisions in a much broader spectrum than ever before.

From our point of view it is an unarguable fact that Internet offers a vast mass of information, some of which is suitable for schools whilst some is not. Without meaning that we should implement extreme measures of censorship or suffocative limitations to the content we allow our users to access, we should be alert and monitor the things that happen while students are online. The problem with Internet content seems to have social, cultural, pedagogic and scientific viewpoints: Schools' trustworthiness is endangered if the school network is used (systematically or occasionally) for other purposes than those for which it was designed and implemented. The parents and the public believe that their children and students proportionately, should be protected from illegal, offensive and inappropriate content. Whilst some may argue that it is a means for censorship and nothing more, others believe it is the only way societies have to inform and protect the children from the potential danger the Internet poses.

Every country should establish its own policies to deal with it without raising public concern regarding human rights and individual's freedoms. This document will try to group all potential dangers the Internet can pose and some possible solutions to those dangers. For us the best solution is the one that combines the right guidance of the students from the educational authority, the informing of parents and the training of educators together with the technical solution. No solitary technical working-out can resolve such a problem and whichever policies put forth should take in mind all the above parameters.

Status in the other Countries

Each of the countries presented here, establishes it's own policies and methods. However, their perception of the problem presents some surprisingly common characteristics. In our survey we browsed some interesting and concise pages regarding the pronounced decisions on the Internet content issue in Australia [12], Canada [7], United States of America [3] and the European Union [11].

Internet is being used in Australian schools with highly increasing rates, as a learning driving force in education. 43% of the children asked in Australia said that Internet improved their perception about school. The federal government of Australia responded to the issues posed by the entrance of Internet in the everyday and school life, with the Broadcasting Services Amendment Act (1999). A hot line was created to allow people report what they think is illegal and express their worries about the content that can be accessed on the Internet. The industry plays important role by establishing policies for the improvement of the information exchange regarding the content of the web pages. In some cases schools store pages certified as 'safe quality pages' in their cache, ensuring by that way that their students have quick access to them. While these pages are available for the benefit of students reducing the bandwidth consumption, the costs for schools remain low because of the quicker access time achieved for stored sites. In Australia the decisions are made on the school level (in some states there is a trend for more obligatory policies decided on a higher level of authority). Education authorities stress the importance of accessing pages of high quality. Educators in national level do the evaluation of pages selected to meet certain specifications. Recent studies point out that almost 98% of public schools connected to the Internet have established Acceptable Use Policies. 74% of schools with AUP use software to block or filter pages of certain content, 64% uses rules of conduct and 28% uses an intranet in their effort to control access.

To date, Canadians have established a wide range of partnerships to deal with the issues of the Internet content. The strategy of Canada's Government is to make Canada the most connected country in the world. Illegal content — content that violates Canada's laws — is of key concern to Canadians. Child pornography and hate propaganda are particularly troubling, because they pose the greatest and most immediate risk to the safety and well being of Canadians. Enforcing the law in cyberspace, however, presents significant challenges, particularly in view of rapid technological change. For Canadians it is important to distinguish between Internet content that is illegal, and content that is offensive to some, but is not illegal. The control and management of offensive content, however, calls for different approaches, such as empowering users, educating consumers to make informed choices, and establishing responsible industry practices. The *Canadian Charter of Rights and Freedoms* guarantees all persons in Canada "freedom of thought, belief, opinion and expression, including freedom of the press and other media of communication". The federal government's approach is to involve a broad spectrum of Canadians in addressing the issues. Its priorities include supporting initiatives that educate and empower users, promoting effective industry self-regulation, strengthening the enforcement of laws in cyberspace, implementing hotlines and complaint reporting systems and fostering consultation between the public and private sectors, and their counterparts in other countries. A considerable number of important initiatives, studies and discussion have taken place or are in progress in Canada. In 1994, the Government of Canada established the private sector Information Highway Advisory Council (IHAC) to provide advice on the best way to develop Canada's Information Highway. According to its recommendations the federal government should a. fine-tune existing laws to make them more applicable and enforceable in the changing world of global networks and b. encourage research and the development of technical tools that can protect users against offensive content on the Internet, and assist in law enforcement.

The United States of America Congress passed legislation requiring Internet blocking technology to block pornographic materials in all public schools and libraries funded through certain federal programs. The *Children's Internet Protection Act – CIPA* passed the senate and the congress on December 2000 as part of a big government budget for the year 2001. To date the issue of content control in the United States of America is in a critical point: while the congress decided the mandatory implementation of filtering in schools and libraries, parents, organizations and politicians are steadily opposed to the legislation passed. Influential organizations are hostile to it and government bills mandating filtering in schools and libraries face legal challenges on constitutional issues. Some libraries have already been sued for installing filtering software onto their computers. Parents, schools and libraries face difficulties to decide whether, and how, to filter Internet content [8]. Still nobody denies the fact that the World Wide Web is not content zoned, which means that kids can access anything on it very fast and very easily. As for the libraries, while school libraries have special characteristics, public libraries are intended for free willing inquiry and access control is a more complicated issue.

The European Union has published an Action Plan on promoting safer use of the Internet [4]. While it recognises the positive benefits of Internet (particularly in education) it states that the amount of harmful and illegal content carried over the Internet, while limited, could adversely affect the establishment of the necessary favourable environment for initiatives and undertakings to flourish. A safer environment should be provided by combating illegal use of the technical possibilities of the Internet, in particular for offences against children and trafficking in human beings or for the dissemination of racist and xenophobic ideas, ensuring that consumers make full use of the Internet. Europe should promote industry self-regulation and content-monitoring schemes, the development of filtering tools and rating systems by the industry and of course international cooperation. While any hot-line reporting mechanisms should support and promote measures taken by the Member States, duplication of work should be avoided. The responsibility for prosecuting and punishing those responsible for illegal content should remain with the national law-enforcement authorities.

Techniques and Solutions

The techniques that can be used to achieve content filtering are keyword blocking, negative and positive lists and content labeling and rating systems. Keyword blocking prohibits access to pages that contain the specified words (words can be tobacco, wine, drug, sex etc). Unless this is a 'clever' software (rarely this is the case) this technique cannot successfully address the modern issues. It can be easily bypassed as it has been reported that web developers add additional characters to the words they suspect that can be searched for. The use of negative and positive lists is easy from filters or browsers. The positive lists contain URLs and domains to which access is allowed to and negative lists contain the URLs that access is prohibited to. Use of white lists will be very

restricting regarding the amount of available pages on the net. Labeling and rating systems provide a way to categorize pages according to their content and provide that categorization to the user. That technique can proved to be inefficient if nobody offers to undertake the task of labeling. The main problem is the size of the Internet and the rate of its daily expansion (there is some indication that Internet growth today has gone from exponential to linear).

Access control can be achieved using Commercial Software, Freeware Programs, Rating Systems or Hardware Solutions (all of them are mainly structured on the use of lists).

Many commercial filtering programs advertise that can block access to the harmful or improper pages on the Internet (in fact they claim they can do much more). There are programs that can be installed at the server side, some are for clients only, while other offer versions for home and for education. The problem with commercial software is that the companies usually do not reveal the pages they block access to [4]. This solution is not favorable for a school environment for one more reason: The filtering is done by a third and not by the government or an educational authority. This gives to the company that implements the filtering, access to sensitive data. The use of proxies has a policy problem: proxy servers keep log files. These files contain all the requests a proxy receives, causing complaints and worries regarding the people that gain access to that data and the processes that can be put in place to monitor individual users' behavior. Although it seems that today there is a some development under way on rating systems everyone should remember that this method might proved to be of little efficiency if there is not someone who will undertake the task of labeling and rating of sites in Internet in a continual basis. Hardware solutions appear to be more complete, with specialized systems of black box type. They are intended as big scale solutions for huge users' databases and lines of high capacity. They require minimal efforts to be installed, configured and operate while full support is offered from their company. Along with that comes the usually high cost to obtain such a system.

Policies

Currently in Greece there is no government decision regarding the policies mentioned here. The policies' part of our suggestions -it could also serve to initiate a public discussion regarding content filtering and content blocking in Greece- is:

1. Creation of Acceptable Use Policies for the Greek School Network to inform users for the purposes of the creation of the technological infrastructure of the school network and the actions or behaviors that are considered acceptable. Most such policies include: Description of the underlying philosophy and strategy implemented into the school network for the access to Internet, Report of the educational uses and advantages of Internet, List with the catalogue of the duties teachers and students have on the issues involved by the use of Internet, Description of what is considered acceptable and what not acceptable use of the school network and of the Internet, Reminder that the access to the school network and to the Internet is a privilege, Specification of the pages considered as 'improper', 'harmful', 'illegal', or 'void of educational content'. 2. A critical point is the responsible, with no exaggerations informing of the teachers. Without their sincere participation success will prove hard. 3. Control of the time and opportunities students will have access to the computers (when in lesson hour, they will be supervised from their teachers). 4. Control of installation of software on school computers. The common problems are license issues, installation of 'Trojan horse' programs (programs with malicious or harmful code), worms, etc. 5. Availability of educational material to constitute the positive counteroffer. The network itself is not the main objective: The main intension of schools is the use of all possible ways and new technologies for educational purposes, and therefore the use of the school network and equipment for specific cognitive purpose. 6. The age of students should be taken in consideration(ages from 6 to 11 are the most vulnerable). 7. Provision of the cachemaster's mail address for communication between him and the school community. 8. Extra security considerations and policies if the school provides email accounts for students and teachers (not true currently in Greece but visible in the very near future).

Architecture

The Greek School Network's topology is illustrated in the next figure.

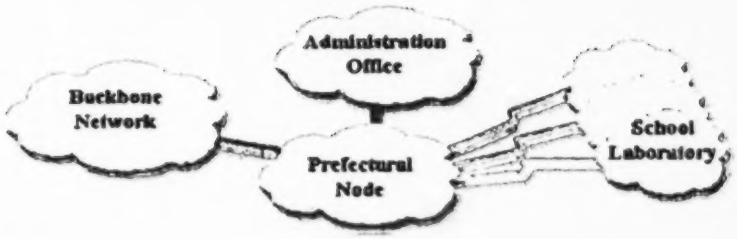

Fig1 : The Greek School Network topology

The backbone network is the Greek Research and Technology Network (GRNET), which provides Internet Services to the Greek Academic and Research community. The distribution network is the part of the network that interconnects points of presence (nodes) with the backbone network. The topology has such design in order to preserve the operational cost in low levels, which is particularly critical in large geographical region networks. The proposed architecture is in favor of the use of a proxy -cache server for the school network because the proxy server on a network -especially when it is configured as transparent- is the ideal point for the implementation of control on the requested objects.

The extent of Squid's usage in educational networks all over the world and the level of acceptance it enjoys from the global networking community (especially researchers, scholars and educators), is obvious from the number of networks implemented on: the JANET network (a private, government funded network for education and research in England with 90 to 120 million hits per day), the italian GARR network, the german DFN network, the Swiss network SWITCH, the Dutch network SURFnet and the USA academic network the NLANR. We are going to use Squidguard as the redirector of our choice because it is faster and opens less redirectors than it's competitor programs.

Implementation Issues

Squid is free software, licensed under the terms of the GNU (General Public License). The most important resource for squid's performance is physical memory, so fast disks are important for high-volume caches. Some new options were added to squid's configuration file after its last release. All new parameters intend to improve the performance, the security or the flexibility of the program. Available options are selective logging and the use of time spaces, ip ranges or users ids in order to grant or deny access at certain hours of day, at certain ips or at certain users.

Conclusions

The rapidly evolving nature of the Internet virtually ensures that no filtering technology can be a hundred percent perfect. Certain kinds of network management products may provide basic information on how students and staff are using the network but the parental and school guidance will remain the basic factor to the solution of the problem.

If a school district employs monitoring or filtering, its Acceptable Use Policy should explain what it would be doing, and the procedures a student should follow if he or she encounters a site that would be considered inappropriate.

The practices are quite the same across the different nations. This happens because the filtering problem is relatively new and those who started first to deal with it lead the way. The content filtering issue we discuss herein has never caused a central debate either from parents for their kids or from school teachers or even from the government in Greece. We work on that issue because we believe that every country should be aware of the possible dangers and be as prepared as possible to deal with them. If we know and understand what happens in the rest of the world and in countries that have a lead over Greece in technological issues we will save ourselfs time and trouble.

The biggest percentage of the pages on the net is written in English which is nowadays an international language. Therefore the most interesting sites and definitely those which get read from the biggest audience are

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the same even for the countries whose language is other than english. That means that the problems are the same since their source is the same. This is why many countries seem to adopt the same strategies despite their natural differences.

A convenient solution for the most educational institutions has been the installation of filtering software on the proxy server. This is the ideal place to do filtering for a network because it is the one point through which all network communications pass. Filtering on a proxy server can have an impact on network performance because of the need to match a URL against what may be a long list of blocked sites. The use of a caching server can help speed access and reduce the bandwidth that would otherwise be needed.

Web server surveys have shown there were more than 27 million web servers in operation as of January 2001 [15]. One study estimated the Web to have approximated 800 million pages in February 1999 [13]. While the above results are not accurate for 2001, they are indicative of the order of magnitude of the sites on the Internet. If this is to change, obviously it won't shrink. The lists every software uses to block access to sites will probably include controversial entries. As these lists cannot be human reviewed the common way to cope with problems that might arise is the creation of an environment which allow the modification of the lists and provide the required information to the users.

Even if we find the ideal solution and implement it in our school networks, no one can guarantee that this will be the ideal solution or even an appropriate one, in one or two years time. People with wide knowledge of the Internet and the emerging technologies should monitor the developments that take place and adjust their policies to the new era.

Implementation of content/access control doesn't solve radically the problem of students using the school networks to gain access to objectionable or illegal material. There is a number of ways that can be used to exchange that material and email and ICQ are only the two most common programs to do that. While solutions for that issues do exist (there are programs that allow only the execution of authorized programs, while the rest are locked out), the governments and the school communities should decide if they wish to implement so hard constraints.

Future Work

Our future plans include the improvement of the current design and architecture to best fit the continually emerging technologies and to therefore address successfully the new problems that almost certainly will come up. The listing of the blocked sites (everybody could see it) and the ability to add or remove sites to the squidquard database (administrators only) through a web interface is a big priority already on discussion.

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